3 COST ESTIMATES

The order-of-magnitude estimates presented in this TM are consistent with Class 5 estimates per Association for the Advancement of Cost Engineering International (AACEI) guidelines (AACEI, 2011). Engineering, design, permitting, and support services are based on percentage of the order-of-magnitude construction cost estimate. The AACEI describes a Class 5 in the following manner:

> *Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 2% to 10% complete. They are often prepared for strategic planning purposes market studies assessment of viability project location studies and long range capital planning. Virtually all Class 5 estimates use stochastic estimating methods such as cost curves capacity factors and other parametric techniques. Expected accuracy ranges are from –20% to –50% on the low side and +30% to 100% on the high side, depending on technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances. As little as 1 hour or less to perhaps more than 200 hours may be spent preparing the estimate based on the project and estimating methodology*

3.1 Basis of Cost

Based on the conceptual sizing and layout presented in previous sections, order-of-magnitude cost estimates were developed for each project using the unit costs of similar stormwater BMPs described in the *Multi-Pollutant TMDL Implementation Plan for the Unincorporated County Area of Los Angeles River Watershed* (LACDPW, 2010). Unit costs were verified and modified based on recent construction experience for similar projects. Unit costs from the report were escalated from the report's 2009 estimates to 2015 values using the Engineering News-Record (ENR) Building and Construction Cost Index (ENR, 2015). **Table 6** presents the unit costs for the major construction components of the conceptual designs.

Table 6

Conceptual Design Major Components Unit Costs

Construction Component	Unit Cost
Mobilization[1]	10% of construction total
Site Preparation[1]	$6,000 per acre
Excavation and Removal	$30.00 per cubic yard
Asphalt/Base Removal	$9.60 per cubic yard
Reinforced Concrete Pipe[1]	$16.00 per diameter (inch) per length (foot)
Gravel Sub-base	$63.00 per cubic yard
Backfill Material[1]	$20.00 per cubic yard
Landscaping[1]	$5.00 - $25.00 per square foot
96-inch Corrugated Metal Pipe[2]	$111,000 per acre-foot
Planning/Project Management[1]	20% of total construction costs
Design and Permitting (Centralized)[1]	15% of total construction costs
Contingency for Planning Estimate (Centralized)	25% of total construction costs

Notes:
1. Unit costs have been modified from TMDL Implementation Plan based on recent construction experience for similar projects.
2. Material costs for the 96-inch CMP used in subsurface infiltration basins were provided by Contech Engineering Solutions. Costs include CDS pretreatment.

3.2 Assumptions for Cost Estimates

Several assumptions were made to develop the order-of-magnitude cost estimates. As planning-level estimates, the costs presented in this TM are based on the conceptual understanding of the projects to date and are subject to change pending the development and design of the projects. Several assumptions were included in the *Multi-Pollutant TMDL Implementation Plan for the Unincorporated County Area of Los Angeles River Watershed* (LACDPW, 2010). The assumptions used in the development of the referenced report apply to the cost estimates developed in this TM. These assumptions have been modified based on the specific aspects of the regional EWMP projects and are presented below for reference.

3.2.1 Planning/Project Management

Additional administrative costs will be required to administer, manage, and coordinate the project's implementation and are included with the planning costs. Administrative costs can vary widely with the complexity of the project, but for purposes of comparison, a value of 20 percent of the capital costs is assumed for planning.

3.2.2 Design/Permitting

Meeting regulatory requirements and obtaining environmental permits will be required for construction implementation. The applicability of many regulations for a specific project depends on its site or design characteristics.

Designing structural BMPs requires collecting data, analyzing it, and preparing documents that can be used for constructing a project. Data collection will include geotechnical investigations, field investigation of existing utilities (potholing), and a topographic survey for mapping. The design deliverables are project plans and specifications that can be bid by a contractor for construction. Engineering costs can vary widely depending on the complexity of the project. For the purposes of the cost estimates, a fixed rate of 15 percent was applied to the centralized BMP construction costs to estimate the design /permitting cost.

3.2.3 Construction

Construction costs are based on the BMPs major components. Assumptions used in estimating costs are provided below.

- Mobilization: Mobilization costs are highly variable depending on the magnitude of the project. A mobilization factor of 10 percent was included.
- Site Preparation: Site preparation includes various tasks associated with preparing site for construction, such as security and setback controls, removal and storage or existing items, and preparation of construction staging areas.
- Excavation and removal: Excavation and removal costs include the cost of excavating the volume of soil required to provide the required storage, hauling the removed dirt off-site, and disposal at an appropriate facility. The estimate is based on previous concept-level Los Angeles Department of Public Works and North Carolina State University estimates (LACDPW, 2010).
- Asphalt/Base Removal: Costs are included for areas that can be implemented as a retrofit. The estimate is based on data from R.S. Means (LACDPW, 2010).
- Reinforced Concrete Pipe: Costs were derived from R.S. Means and are included to estimate the costs for constructing a storm drain extension of or to bypass an existing storm drain system.
- Gravel Sub-base: A gravel sub-base consisting of a washed No. 57 stone typically used as a base for roads and any construction. The estimate is based on quotes from vendors for No. 57 stone and R.S. Means (LACDPW, 2010).
- Landscaping: One of the benefits of distributed BMPs is that they can be integrated into the site plan and often incorporated into the landscaping. Landscaping costs were estimated using data from North Carolina State University (LACDPW, 2010). It is generally suggested to use native landscaping for any BMP because native landscaping is more adapted to the natural conditions

increasing the survivability, although in many cases, landscaping will consist of grass or ball fields to achieve multiple objectives of the project.

- Contingency: Because some of the project components have not been fully defined at this preliminary stage, a contingency factor of 25 percent has been applied to the construction costs to estimate the total construction costs and capture expected but as yet unidentified additional costs. The costs could arise from site-specific field conditions such as those associated with utility relocations, dewatering, and erosion and sedimentation control. At this stage of project development, the contingency also includes an allowance for such items as field facilities and construction scheduling, which might be required but are not specifically itemized.

3.3 Cost Estimates for Regional EWMP Projects

The total project costs for the regional EWMP projects are summarized in **Table 7.** A detailed breakdown of the order-of-magnitude cost estimate for each project is presented in **Table 8** through **Table 17**. It is important to note that these costs only consist of the initial capital costs to construct the projects and do not include costs associated with long-term operation and maintenance.

Table 7

Summary of Regional EWMP Project Cost Estimates

Site Name	Total Project Cost
Finkbiner Park - Alternative	$5,515,000
La Puente Park	$699,000
Allen J Martin Park	$11,038,000
Bassett Park	$8,622,000
Kahler Russell Park	$22,686,000
San Angelo Park	$7,730,000
Barnes Park	$14,061,000
Adventure Park	$4,881,000
Downtown Properties (Glendora)	$2,705,000
San Jose Properties (Glendora) - Alternative	$1,375,000
Total Cost of Regional EWMP Projects	**$79,312,000**

Table 8

Finkbiner Park – Alternative – Preliminary Cost Estimate

Site Name
Finkbiner Park
BMP Type
Subsurface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$689,000
Design/Permitting	% of Total Construction Cost	15%	--	$517,000
Planning & Design Total				**$1,206,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	20,700	$621,000
Asphalt/Base Removal	$/yd^3	$9.60	1,400	$13,000
Site Preparation	$/acre	$6,000.00	1.0	$6,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	66,100	$1,058,000
Gravel Sub-base	$/yd^3	$63.00	6,800	$428,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	41,400	$207,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	6,900	$138,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	6.0	$663,000
Construction Subtotal				**$3,134,000**
Mobilization	% of Construction Total	10%	--	$313,000
Construction Total				**$3,447,000**
Project Subtotal				**$4,653,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$862,000
Project Total				**$5,515,000**

Table 9

La Puente Park – Preliminary Cost Estimate

Site Name
La Puente Park
BMP Type
Surface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$87,000
Design/Permitting	% of Total Construction Cost	15%	--	$66,000
Planning & Design Total				**$153,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	2,600	$78,000
Asphalt/Base Removal	$/yd^3	$9.60	300	$3,000
Site Preparation	$/acre	$6,000.00	1.0	$6,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	5,900	$94,000
Gravel Sub-base	$/yd^3	$63.00	--	--
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	43,100	$216,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	--	--
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	--	--
Construction Subtotal				**$397,000**
Mobilization	% of Construction Total	10%	--	$40,000
Construction Total				**$437,000**
Project Subtotal				**$590,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$109,000
Project Total				**$699,000**

Table 10

Allen J Martin Park – Preliminary Cost Estimate

Site Name
Allen J Martin Park
BMP Type
Subsurface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$1,380,000
Design/Permitting	% of Total Construction Cost	15%	--	$1,035,000
Planning & Design Total				**$2,415,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	57,700	$1,731,000
Asphalt/Base Removal	$/yd^3	$9.60	500	$5,000
Site Preparation	$/acre	$6,000.00	2.7	$16,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	31,100	$498,000
Gravel Sub-base	$/yd^3	$63.00	19,000	$1,197,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	116,000	$580,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	19,400	$388,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	16.8	$1,856,000
Construction Subtotal				**$6,271,000**
Mobilization	% of Construction Total	10%	--	$627,000
Construction Total				**$6,898,000**
Project Subtotal				**$9,313,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$1,725,000
Project Total				**$11,038,000**

Table 11

Bassett Park – Preliminary Cost Estimate

Site Name Bassett Park **BMP Type** Subsurface				
Project Component	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$1,078,000
Design/Permitting	% of Total Construction Cost	15%	--	$808,000
Planning & Design Total				**$1,886,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	47,600	$1,428,000
Asphalt/Base Removal	$/yd^3	$9.60	200	$2,000
Site Preparation	$/acre	$6,000.00	2.2	$13,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	9,600	$154,000
Gravel Sub-base	$/yd^3	$63.00	15,600	$983,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	95,100	$476,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	15,900	$318,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	13.8	$1,525,000
Construction Subtotal				**$4,899,000**
Mobilization	% of Construction Total	10%	--	$490,000
Construction Total				**$5,389,000**
Project Subtotal				**$7,275,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$1,347,000
Project Total				**$8,622,000**

Table 12

Kahler Russell Park – Preliminary Cost Estimate

Site Name
Kahler Russell Park
BMP Type
Subsurface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$2,836,000
Design/Permitting	% of Total Construction Cost	15%	--	$2,127,000
Planning & Design Total				**$4,963,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	126,000	$3,780,000
Asphalt/Base Removal	$/yd^3	$9.60	300	$3,000
Site Preparation	$/acre	$6,000.00	5.8	$35,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	20,300	$325,000
Gravel Sub-base	$/yd^3	$63.00	41,300	$2,602,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	252,000	$1,260,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	42,000	$840,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	36.6	$4,044,000
Construction Subtotal				**$12,889,000**
Mobilization	% of Construction Total	10%	--	$1,289,000
Construction Total				**$14,178,000**
Project Subtotal				**$19,141,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$3,545,000
Project Total				**$22,686,000**

Table 13

San Angelo Park – Preliminary Cost Estimate

Site Name
San Angelo Park
BMP Type
Subsurface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$966,000
Design/Permitting	% of Total Construction Cost	15%	--	$725,000
Planning & Design Total				**$1,691,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	37,600	$1,128,000
Asphalt/Base Removal	$/yd^3	$9.60	700	$7,000
Site Preparation	$/acre	$6,000.00	1.7	$10,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	40,000	$640,000
Gravel Sub-base	$/yd^3	$63.00	12,300	$775,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	75,100	$376,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	12,600	$252,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	10.9	$1,204,000
Construction Subtotal				**$4,392,000**
Mobilization	% of Construction Total	10%	--	$439,000
Construction Total				**$4,831,000**
Project Subtotal				**$6,522,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$1,208,000
Project Total				**$7,730,000**

Table 14

Barnes Park – Preliminary Cost Estimate

Site Name Barnes Park **BMP Type** Subsurface				
Project Component	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$1,758,000
Design/Permitting	% of Total Construction Cost	15%	--	$1,318,000
Planning & Design Total				**$3,076,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	76,900	$2,307,000
Asphalt/Base Removal	$/yd^3	$9.60	300	$3,000
Site Preparation	$/acre	$6,000.00	3.5	$21,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	20,200	$323,000
Gravel Sub-base	$/yd^3	$63.00	25,200	$1,588,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	153,700	$769,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	25,700	$514,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	22.3	$2,464,000
Construction Subtotal				**$7,989,000**
Mobilization	% of Construction Total	10%	--	$799,000
Construction Total				**$8,788,000**
Project Subtotal				**$11,864,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$2,197,000
Project Total				**$14,061,000**

Table 15

Adventure Park – Preliminary Cost Estimate

Site Name Adventure Park **BMP Type** Subsurface				
Project Component	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$610,000
Design/Permitting	% of Total Construction Cost	15%	--	$458,000
Planning & Design Total				**$1,068,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	26,800	$804,000
Asphalt/Base Removal	$/yd^3	$9.60	200	$2,000
Site Preparation	$/acre	$6,000.00	1.2	$7,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	6,000	$96,000
Gravel Sub-base	$/yd^3	$63.00	8,800	$554,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	53,600	$268,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	9,000	$180,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	7.8	$862,000
Construction Subtotal				**$2,773,000**
Mobilization	% of Construction Total	10%	--	$277,000
Construction Total				**$3,050,000**
Project Subtotal				**$4,118,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$763,000
Project Total				**$4,881,000**

Table 16

Downtown Properties (Glendora) – Preliminary Cost Estimate

Site Name
Downtown Properties (Glendora)
BMP Type
Subsurface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$338,000
Design/Permitting	% of Total Construction Cost	15%	--	$254,000
Planning & Design Total				**$592,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	14,400	$432,000
Asphalt/Base Removal	$/yd^3	$9.60	1,600	$15,000
Site Preparation	$/acre	$6,000.00	0.7	$4,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	15,000	$240,000
Gravel Sub-base	$/yd^3	$63.00	4,700	$296,000
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	--	--
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	4,800	$96,000
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	4.1	$453,000
Construction Subtotal				**$1,536,000**
Mobilization	% of Construction Total	10%	--	$154,000
Construction Total				**$1,690,000**
Project Subtotal				**$2,282,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$423,000
Project Total				**$2,705,000**

Table 17

San Jose Properties (Glendora) – Alternative – Preliminary Cost Estimate

Site Name
San Jose Properties (Glendora)
BMP Type
Surface

Project Component	Unit	Unit Cost	Quantity	Total Cost
Planning & Design				
Planning/Project Management	% of Total Construction Cost	20%	--	$172,000
Design/Permitting	% of Total Construction Cost	15%	--	$129,000
Planning & Design Total				**$301,000**
Construction				
Excavation and Removal	$/yd^3	$30.00	7,700.0	$231,000
Asphalt/Base Removal	$/yd^3	$9.60	600.0	$6,000
Site Preparation	$/acre	$6,000.00	1.3	$8,000
Reinforced Concrete Pipe	$/in-diameter/ft-length	$16.00	16,300.0	$261,000
Gravel Sub-base	$/yd^3	$63.00	--	--
Landscaping (includes mulch/sod and vegetation)	$/ft^2	$5.00	55,000.0	$275,000
Native/Complex Landscaping	$/ft^2	$25.00	--	--
Backfill	$/yd^3	$20.00	--	--
Infiltration - 96" CMP Material Cost	$/ac-ft	$110,500.00	--	--
Construction Subtotal				**$781,000**
Mobilization	% of Construction Total	10%	--	$78,000
Construction Total				**$859,000**
Project Subtotal				**$1,160,000**
Contingency for Planning Estimate	% of Total Construction Cost	25%	--	$215,000
Project Total				**$1,375,000**